MAY 15 1925 Medical Lib

Vol. II. No. 4. April, 1925.

British Journal of Anæsthesia

EDITORIAL BOARD

Editor:
H. M. COHEN, M.D. (U.S.), M.R.C.S., L.R.C.P.,
Senior Anæsthetist, St. Mary's Hospitals, Manchester.

Hon. Sec. and Treasurer:
S. R. WILSON, M.SC., F.R.C.S.E.,
Lecturer on Anæsthesia, Manchester University.

JOSEPH BLOMFIELD, O.B.E., M.D. (Cantab.),
Lecturer Anæsthetics,
St. George's Hospital, London.

H. E. G. BOYLE, O.B.E., M.R.C.S., L.R.C.P.,
Lecturer Anæsthetics,
St. Bartholomew's Hospital, London.

DUDLEY W. BUXTON, M.D., B.S., M.R.C.P.,
Consulting Anæsthetist to University
College Hospital.

H. F. FAIRLIE, M.D.,
Anæsthetist to Royal Infirmary and
Hospital for Sick Children,
Glasgow.

A. L. FLEMMING, M.B., CH.B. (Bristol),
M.R.C.S., L.R.C.P.,
Clinical Lecturer Anæsthetics,
Bristol University.

W. J. McCARDIE, B.A., M.B., B.C.,
Clinical Lecturer Anæsthetics,
Birmingham University.

A. J. O'LEARY, L.R.C.S.E., L.R.F.P., S.G.,
Senior Anæsthetist,
Liverpool Royal Infirmary.

J. STUART ROSS, M.B., F.R.C.S.E.,
Lecturer Practical Anæsthetics,
Edinburgh University.

FRANCIS E. SHIPWAY, M.D. (Cantab.),
Lecturer Anæsthetics, Guy's Hospital, London.

SHERRATT & HUGHES, MANCHESTER.

Annual Subscription, £2 post free. :: U.S.A., 10 Dollars.
Single copies, 10s. 6d. Published Quarterly.

The Original

NOVOCAIN AND ITS SOLUTIONS.

The following principles have been laid down for selection of a local anæsthetic:

1. The substance must be less toxic than cocaine in proportion to its local anæsthetic power.

2. The agent must not cause the slightest irritation or tissue injury but must be absorbed from the place of application without any secondary offset, such as severe hyperæmia, inflammation, painful infiltrates, or necrosis. Only when these conditions are fulfilled can we assume that the healing of wounds will not be interfered with. The use of strongly acid or alkaline substances is not permissible, inasmuch as they cause local tissue injury. On account of this important requirement many of the newer anæsthetics have failed in their purpose.

3. The agent must be soluble in water and its solution reasonably stable and sterilizable by simple means.

4. It must be possible to combine the agent with the suprarenin.

5. For application upon mucous membranes the anæsthetic must be able to penetrate rapidly.

NOVOCAIN FULFILS ALL THESE REQUIREMENTS.

Vide "Local Anæsthesia in Dentistry."—Fischer.

Novocain does not contain Cocaine.

Cocaine-Free Local Anæsthetic
FOR
Major and Minor Surgical Operations, also for Dental Extractions and Oral Surgery.

Literature on request.

Beware of so-called "new" Locals using a small percentage of Novocain to raise the standard of inferior preparations and thereby trading on the Novocain reputation.

Buy the original product.

The Original Product.

NOVOCAIN

The Original Preparation.

English Trade Mark No. 276,477.

THE SACCHARIN CORPORATION LTD.

72, OXFORD STREET, LONDON, W.1.

British Journal of Anæsthesia

VOL. II. NO. 4 APRIL, 1925.

EDITORIAL.

THE anæsthetist is rapidly evolving from that comfortable state of mind where his choice of an anæsthetic rested between Ether and Chloroform. And no sooner had Nitrous Oxide-Oxygen entered the field to tempt him from the straight and narrow path than Ethylene and Acetylene loomed large upon the horizon, each with its enthusiastic supporters. However, even before these newcomers have fairly had time to establish themselves upon anything like a sound footing, a new claimant appears in the guise of Local or Regional Anæsthesia.

Thus are we beset on many sides with tempters to drag us from our old allegiance. Whither are we to turn? The virtues of one anæsthetic are no sooner acclaimed than at its very heels another crowds its way, and one new method is no sooner investigated than another calls for our attention.

One is almost tempted to declare, as did a certain policeman, that, taking it all in all, nowadays, an anæsthetist's life is not a happy one.

Comes the gentle and confident voice of Regional Anæsthesia, wafted to us from across the waters, albeit speaking now in high, now in low pitch, to our utter bewilderment.

Farr, of Minneapolis, would have us become Psycho-Anæsthetists, smooth of tongue and bland of manner, entertainer and scientist, skilful anatomist and accomplished musician, as well as efficient in making injections at various and sundry locations.

All of which brings to mind the very evident fact that the Practice of Anæsthesia is rapidly broadening itself into a highly skilful Speciality, and in order to keep abreast of its advance it is urgently necessary to follow the work of such pioneers in the field as Finsterer, Braun,

Kappis, Lobat and Farr, all of whom are developing Regional Anæsthesia to the point of safety and accuracy.

The *British Journal of Anæsthesia*, realizing that in this direction lies Advance, hopes to place shortly before the anæsthetic world papers by the four last-named, of the same high grade as it has already been privileged to do by the first.

The importance of using unbreakable needles in all spinal and regional anæsthesia is stressed by various writers in current literature. In one service it was stated that during six months there occurred four breakages, thus necessitating operative procedures for the removal of the broken parts. Dr. Labat recommends a needle made of nickel which may be bent into any position but cannot be broken. Others never use a needle which enters the spine or caudal canal more than once. The needle should be tested before using and if it can be readily bent into a bow there is no danger of its breaking. Dr. Falk uses a No. 24 gauge needle and discards it after being used once.

In an article by Le Count and Singer ("Hazard of Surgical Anæsthesia with Syphilis of the Brain," *Jl. Amer. Med. Assoc.*, Jan. 31, 1925), emphasis is laid on the fact that these cases may prove fatal under general anæsthesia, therefore they advise that with symptoms or signs suggestive of alterations of any sort in the central nervous system a thorough examination to determine a syphilitic infection should precede any elective operation.

In an article on "Acute Hallucinosis after Operations and Anæsthesia" (Eastman and Kilman, *Amer. Jl. Surg. Anæs. Supplement*, Jan., 1925), mention is made of inadvisability of administering adrenaline along with the injection of novocaine in toxic thyroid cases. In another article, De Lee (*Surg. Gyn. and Obstet.*, Feb. 2) thinks that half the total amount of adrenaline (half a milligram) should not be exceeded in cases where there are signs of hypothyroidism.

In replying to a practitioner who had asked if it was permitted to administer an anæsthetic for a Rabbi who held a certificate for performing the rite of circumcision for Jewish children, the President of the Medical Council replied that "the practitioner should stipulate that from the surgical point of view the patient should be under his professional supervision so that he might safeguard life and health should the official operation endanger either."

It is proposed to hold the June meeting of the Anæsthetic Section, Royal Society of Medicine, in Manchester.

Among prominent American anæsthetists who expect to visit England this summer are Drs. E. I. McKesson and Isabella C. Herb.

THE INFLUENCE OF ANÆSTHESIA ON THE RESULTS OF MAJOR ABDOMINAL OPERATIONS.*

By Professor Dr. HANS FINSTERER (Vienna.).

GENERAL NARCOSIS AND STOMACH DILATATION.

Acute stomach dilatations, in consequence of atony, are of special importance in stomach operations, as here death may be expected, the patient vomiting incessantly, which is erroneously charged to a *circulus vitiosus.* Payer's investigations, and my own clinical observations made 15 years ago when I was an assistant at von Hacker's clinic, showed that any *chloroform narcosis* will cause *dilatation of the stomach* (which is distinctly proved clinically), and which dilatation will then cause the incessant vomiting. Some of my confrères recently also observed very bad cases of stomach dilatation in ether narcosis of long duration. I did not see such dilatations when operating under local anæsthesia. There was none of the violent vomiting which only sets in on the second day and which continues in spite of rinsing the stomach, changing position, etc., and which, in some cases, leads to death. *Vomiting* immediately after the operation is not necessarily the expression of an acute stomach dilatation, but must be referred to an accumulation of blood in the stomach, to repeated morphia injections, to peritoneal irritation, etc., and will cease entirely after 24 hours. Vomiting as a consequence of a bad stomach dilatation on the contrary only sets in on the second day and will be at its extreme the third to fifth day. Most probably it is due to a *central* injury caused by the narcotic. Fatalities in acute atony of the stomach, where the autopsy reveals no peritonitis, are rare, but yet they will occur sometimes, especially after gastroenterostomy. They are missing entirely in my material.

*Continued from the January Number.

Since I abandoned deep general narcosis I have never observed acute *intestinal atony*, which is due to the same cause as atony of the stomach. Though the narcosis is not the only cause of such atony yet it takes the principal part. Mechanical injury and cooling off of the intestinal wall during the operation are of minor importance and also the separation of adhesions. I did not notice the slightest signs of atony in spite of severe injury of the entire intestinal wall in a specially complicated case of resection of an ileo-sigmoidostomy which was previously performed abroad and where for the purpose of orientation and proper position of the loops (turned 180°) almost the entirely adherent small intestine had to be separated from the considerable adhesions; besides, an anastomosis both of the large and small intestines had to be made. In spite of all these injuries evacuation of the bowels was attained the second day after applying hot air and purgatives.

In women who suffer from bad *constipation* prior to operation, or in cases where an abnormally long colon is found, the evacuation of bowels and gases might be rendered difficult, especially when the patients, after the operation, get much morphia or pantopon. However, there will be no higher degree of meteorism, and most of all I was not compelled to perform an enterostomy. If with an *intestinal resection* there is no immediate evacuation of bowels its retardation will be due to the interruption of peristalsis at the place of resection, viz., the local peritonitis. However, there are here no higher degrees of meteorism. I am convinced that this intestinal atony is not due to a general infection or to a peritonitis but to a central cause since it is observed also in operations performed in general narcosis without opening the abdomen. If an infection itself is the cause and atony only secondary, an enterostomy will be to no purpose as the patients will die of progressive infection in spite of enterostomy. To intestinal atonv must be ascribed a special importance in intestinal resection since, if the intestine is too much stretched, the exactly made intestinal suture will burst.

The danger of severe intestinal atony lies in the fact that with over-distension of the intestine for a long time there finally might occur a wandering peritonitis. In one of my

papers published in 1913 I referred to the fact that we have to distinguish two forms of *post-operative peritonitis*:—

(1) *Peritonitis immediately after the operation caused by an infection during the operation itself.*

(2) *Peritonitis occurring only five to six days later.*

Peritonitis and Long General Narcosis.

The first kind of peritonitis almost always is due to an external infection, whereas the unavoidable infection of the operative field from the stomach and intestinal contents of the patient will be injurious only, and cause peritonitis, if the normal prophylactic capacity of the patient is seriously impaired by advanced cachexia, severe hæmorrhage prior to the operation, or a long general narcosis. Therefore, diffuse peritonitis in major operations, when performed under local anæsthesia, will be rare. I have observed it the least in resections of ulcer, and if there was peritonitis, an infection from the outside was easily proved. Only with ex-ulcerated cancer of the stomach can the greatly septic stomach contents cause an infection.

Peritonitis caused by external infection is clinically characterised by the fact that immediately after operation the pulse is frequent and remains so. There will be singultus, eructation and vomiting, and after 24 hours the abdomen will be sensitive to pressure all over, and there will be no evacuation of bowels and gases in spite of all remedies.

With the other kind of peritonitis appearing only after five to six days, the clinical course will be entirely normal at the beginning. By the second day there will be evacuation of bowels and gases, vomiting will cease after 24 hours if there was any vomiting at all. From the second day on the pulse will again be normal and strong, only on the fifth or sixth day the temperature will begin to rise, the pulse will get fast and soft, and the abdomen will be sensitive to pressure all over. There will be no evacuation of bowels and gases, but we will notice singultus, and finally vomiting. If relaparotomy is made on the seventh or eight day in order to perform an enterostomy, we shall find a just-beginning peritonitis issuing from *small abscesses around the silk ligatures* and at the same time a mixture of streptococci and staphylococci can

be demonstrated bacteriologically. I found this picture in three cases. It is a notable fact that this suppurative focus is found only around the *thick* silk ligatures and around the fascia sutures whereas the anastomosis suture made with finest silk is fully intact. In these cases the infection is caused by the insufficiently boiled thick silk-threads which were sterile only on their surface, but not inside, so that after the soaking of these silk threads the bacteria come up to the surface and lead to infection. Of course, such fatalities may not be avoided by local anæsthesia. They were noticed during the war, but not since then.

The later occurring peritonitis may also be the *sequence of an acute intestinal atony*. Formerly when chloroform was principally used it occurred relatively often although it was not always judged right. Secondary peritonitis is distinguished from the primary one by the clinical course. There is no passing of flatus, the abdomen is distended but it is nowhere sensitive to pressure, the pulse is full and strong, no singultus. Only with persisting atony the pulse gets worse on the fourth or fifth day, the abdomen will gradually become sensitive to pressure, and the patient will vomit. With relaparotomy the intestinal loops are enormously overstretched, the serosa is stria-like, reddened, and only a little fibrinous exudation is present. The exuded substances found during autopsy are so little that it is hardly believable that the patient could die of such a trifling peritonitis. In these cases enterostomy performed at several places simultaneously may work wonders, for these patients do not die of peritonitis but of copræmia in consequence of retention of fæces. In none of my cases did I experience a peritonitis as a sequence of atony. This, however, also explains why in no case of post-operative peritonitis could I save the patient by enterostomy, since there is no help for cases with external infection. Among my material there is no case of intestinal atony with secondary peritonitis.

Fatalities in consequence of pulmonary complications are of special importance. The opponents of local anæsthesia still assert that anæsthesia is entirely without any influence on the occurrence of pulmonary complications since even in operations under local anæsthesia fatalities due to pulmonary

complications were observed, and that the number of pulmonary affections was even greater than with operations under general narcosis. At the same time Gottstein is generally cited who, thirty years ago, is said to have proven such thesis by the material of Mikulicz' clinic. In my papers, and more particularly so in my book on "Local-Anæsthesia in Abdominal Surgery," I pointed out that such thesis was wrong since entirely unequal materials were compared with each other. There are many surgeons who operate on such cases under general narcosis only where there is no contra-indication against general narcosis, whereas in the rest of the cases they apply local anæsthesia, either alone or mostly as so-called combined anæsthesia if they are too little experienced to perform such operations under local anæsthesia alone. They will now compare their results and are much pleased if among the cases not complicated by pulmonary or heart affections operated on in general narcosis they do not have more fatalities of pneumonia than among the cases which had to be operated on under local anæsthesia on account of their pulmonary affections. It is clear that such a conclusion is wrong.

In 62 stomach resections performed by Gottstein under general narcosis there were observed 17.7 per cent. of post-operative pulmonary complications, *and 12.9 per cent. died of pulmonary complications,* whereas among 14 resections performed under local anæsthesia the frequency of pulmonary affections was 28.5 per cent., *but no patient died.* Hence in Mikulicz' clinic 12.9 per cent. of otherwise healthy and strong patients operated on under general narcosis died of pneumonia whereas among the patients operated on under local anæsthesia, where general narcosis could not be performed on account of existing cardiac and pulmonary affections, *none of them died of pulmonary complications.* This proves that Gottstein's thesis, viz., that by local anæsthesia the dangers of pulmonary complications cannot be diminished, is wrong and should not be cited any more.

Reinhard operated on 150 cases each with the same disease and in the same way, equally under general narcosis and under local anæsthesia. Whereas among the cases operated on under general narcosis 12.6 per cent. died of pulmonary

complications, there was *no mortality among the cases operated on under local anæsthesia.*

In my material a comparison between general narcosis and local anæsthesia is not possible since I applied local anæsthesia in all cases. However, it is always a notable fact that among 682 stomach resections for ulcer I observed no fatality of pneumonia although I performed resection in all cases, also with bad general condition, with severe cardiac and pulmonary affections and of high age. Among 64 resected patients who were 60-76 years old, only one case died (the patient died of peritonitis in consequence of an infection in the hospital) whereas all the other cases recovered.

Neither chloroform nor ether itself produces pneumonia, which is caused through infection. Snell, however, 20 years ago, proved experimentally that *any narcosis of long duration* with chloroform or ether *will destroy* the normally present *bactericidal prophylactic capacities of the lung,* so that then the bacteria which are present in the bronchi or get there during the narcosis by aspiration may then enter into the pulmonary tissue and thus cause the inflammation. Hence the danger of pneumonia grows with the degree and the duration of the narcosis; also in such cases where prior to operation no affection of the lung could be proved.

The *course of pneumonia* first depends on the *capacity of the heart.* Since the heart gets affected by narcosis, also when using ether, as is proven by König's investigations, the prognosis of pneumonia subsequent to an operation under general narcosis will be worse than subsequent to an operation under local anæsthesia. The cooling off of the patient is only of minor importance, nevertheless it is advisable to avoid any superfluous cooling off in the operating room and especially during transportation through cold passages.

If major abdominal operations are performed on *all* patients, also on old people with chronic bronchitis, or severe emphysema, the *after-treatment* is of special importance. It would be entirely wrong to believe that with these old people any danger is removed by excluding the narcosis. In order to prevent retention of the bronchitic secretion, the patients not only must breath deep systematically, but first of all they must *cough out energetically.* With median laparotomy

above the umbilicus such coughing causes considerable pain in the first days, and this is why nervous patients hesitate to cough. If such patients are given small doses of morphia it will alleviate the pain but it will diminish the cough and therefore expectoration is deficient. For this reason I very rarely give morphia, at the most for the night. It is most important that the operator himself, his assistants and especially the attendants, vigorously help the patient in coughing out by supporting the abdominal walls from the side while coughing, and with emphysema eventually to compress rhythmically the thorax. If during the first two days the patient does not cough out sufficiently in consequence of too much morphia then also with local anæsthesia the danger of retention pneumonia, hence of lobular pneumonia, will be great. In order to diminish such danger as much as possible with old people I am exceedingly careful with the use of morphia, and at the most I allow one injection in the evening of 0.01—0.015 (one-sixth to one quarter of a grain) morphia subscutaneously. During the day alkaloid is absolutely avoided, whereas for alleviating the pain hot air is often applied. All patients in whom chronic bronchitis could be proved prior to operation, besides such as are more than 60 years old, regularly get *camphor*, which is the best expectorant, in the form of injections of 2-3 g. oleum camphoratum every other hour.

Fatalities of pneumonia may be almost always prevented owing to the fact that the heart is not affected by general narcosis, and that by careful after-treatment the bronchitic secretion is regularly evacuated. I too succeeded in avoiding fatalities with resections for gastric ulcer, whereas among 225 *resections for cancer* of the stomach I experienced six pneumonia fatalities. Of these there were three cases operated on under local anæsthesia only, whereas in three cases there was simultaneous support with ether : 20 ccm., 70 ccm. and 150 cm. Only in the last case may we speak of a combined anæsthesia where a bilateral pneumonia rapidly developed. In the first three cases I had to deal with old and very cachectic patients suffering from a much advanced cancer. One was 71 years old suffering from a constricting cancer of the stomach that had extended over to the colon, emaciation 80 pounds, body-

weight 72 pounds; resection of the stomach and the colon. Another patient, who was 68 years old, on whom a resection of the stomach and pancreas was performed got pneumonia on the twelfth day only when the patient walked about and acquired an acute cold in the garden which made his chronic bronchitis worse.

With resection of cancer of the stomach when operating on patients who are so weak that they can hardly cough out we shall have to count with fatalities of retention pneumonia. In spite of the six fatalities one might be satisfied with the results of local anæsthesia in cases of cancer resection if one considers that among my 225 cancer resections, where in 81 cases parts of the pancreas, liver and colon were removed simultaneously, there were 75 patients who were more than 60 years old and up to 76 years, and that most of them were emaciated by the long duration of the disease.

The fact that I experienced *no pneumonia fatality* among 682 stomach resections for ulcer, 211 cholecystectomies and choledochotomies, 54 resections of the small intestine, and 116 resections of the colon, totalling 1,063 major abdominal operations, although a radical operation was performed on *all* cases in spite of the great age and existing cardiac and pulmonary affections, is another proof that Gottstein's theory *that the danger of pulmonary complications cannot be diminished by resorting to local anæsthesia is not sound.*

Since on the ground of my favourable experiences I am *convinced* of the great advantage of local anæsthesia over general narcosis, I feel obliged to apply local anæsthesia in all major abdominal operations. After explaining the dangers of the operation itself and the dangers of general narcosis, most patients will consent to the operation under local anæsthesia. If a patient asks to be operated on under general narcosis, I never force him to be operated on under local anæsthesia. I then send such patients to other surgeons who only operate under general narcosis. In public hospitals when patients absolutely ask for general narcosis, and if they are not too old or suffering from severe cardiac and pulmonary affections, the operation may start out under ether or nitrous-oxide narcosis, but this is immediately followed by an exact conductive anæsthesia of the abdominal walls, then splanchnic

anæsthesia, upon which general narcosis is dispensed with entirely, so that resection is performed only under the influence of local anæsthesia. Quite little and harmless quantities of ether will do.

I operated in this manner on a patient, 29 years old, who on account of her great nervousness asked that the operation be performed under ether, of which only 70 ccm. was used all through the operation, which consisted of a stomach and intestinal resection for gastro-jejunal ulcer after a gastro-enterostomy and a cholecystectomy. During the operation itself the patient was quiet in spite of her pretended nervousness, for the operation was absolutely painless. If nitrous-oxide narcosis is available it should be given the preference over ether since the patients wake up rapidly and without any vomiting. I learned to appreciate this combination of local anæsthesia and temporary nitrous-oxide narcosis during my work in America.

In nervous patients who at the beginning are afraid of the operation under local anæsthesia, the operation may be performed if the anæsthesia is a complete one without doing harm to the patient by the psychical shock. In this point I do not agree with Crile who lays so much weight on the injurious consequences of psychical shock. There is a difference between the facts whether a patient is afraid of imaginary pains or whether, as Crile has proved by his experiments on animals, the psychical excitement is caused by real pains. In my whole material I did not experience a single fatality immediately after the operation which fatality would be unavoidable with weak and excitable patients if the psychical shock would be really harmful as Crile asserts. In spite of it with nervous patients one may apply local anæsthesia combined with a superficial nitrous-oxide narcosis if such latter is at disposal since it is entirely harmless as proven by Crile.

The systematic exclusion of deep general narcosis must *improve the results of all operations.* I am going to cite just a few examples.

With *stomach resection for cancer* the results improved in spite of extended indication compared with the heretofore communicated reports which yet show a mortality of 20—40

per cent. Although in all cases of cancer I perform at least an exploratory laparotomy, since the operability can be decided upon only by such laparotomy, I could perform resection 225 times—62 per cent. out of 367 cases of cancer of the stomach. At the same time we must consider that in 81 cases the cancer had grown into the neighbouring organs so that besides an almost subtotal stomach resection still larger parts of the pancreas, the liver, the colon transversum, etc., had to be removed. In further 15 cases metastases in the liver and the peritoneum had to be left behind knowingly, hence one had to deal with palliative resections. While in these much advanced cases the mortality is relatively high (33 per cent.) because of the wound infection there *was a mortality of* 6.9 *per cent. only out of* 129 *cases where cancer was limited only to the stomach.* In opposition thereto Payer in 1920 figures the mortality of simple cancer resections performed under general narcosis as 30 per cent. In my material more than two-thirds of all resections were performed under local anæsthesia alone, and using splanchnic anæsthesia only in about 10 per cent. of the cases a temporary support by ether was required.

I must emphasise that I had *no fatality immediately after the operation of so-called operation shock* or cardiac collapse although resection was performed under bad general conditions (13 patients had a body weight below 80 pounds). The *two-stage resection* (first gastroenterostomy and later on resection), which is especially applied in America, may be abandoned, when using local anæsthesia, as the 13 cases with a body-weight below 80 pounds have all stood the resection very well.

Likewise among the 682 *stomach resections for ulcer* there is not *a single fatality from operation shock* or cardiac collapse, *nor any pneumonia fatality.* The mortality which was greater during the war, on account of the fatalities from peritonitis, is much less since, as following 1919, it is 5.1 per cent. in resection of gastric ulcer (136 resections with seven fatalities) and 2 per cent. in resection of duodenal ulcer (249 resections with five fatalities), totalling 3.1 per cent. In past years Braun's splanchnic anæsthesia from the front was used almost exclusively which, by itself, was sufficient in more than 90 per cent.

of the cases, whereas, when using mesenterial anæsthesia, some ether was required in almost two-thirds of the cases.

In my material of *radical operation for ulcus pepticum jejuni*, which consists of the removal of the duodenum with the old ulcer, of the pylorus, and at least two-thirds of the stomach together with the anastomosis loop, the results are very good in spite of the extension and difficulties of the operation, as there were only two fatalities among 52 radical operations = 3.8 per cent. mortality. Though in these cases it will not always be possible to manage with local anæsthesia only on account of the long duration of the operation, yet the subsequently necessary quantities of ether are so little that the prognosis of this operation will hardly be impaired thereby.

My material of *cholecystectomies* is relatively small compared with the stomach resections; however, here also the favourable influence of anæsthesia is seen. Exact conductive anæsthesia of the abdominal walls and splanchnic anæsthesia according to Braun produces absolute painlessness and sufficient muscular relaxation. Cholecystectomy was done in all cases, also in the acute attack. Here also I had *no fatality* immediately after the operation, nor the third to fifth day, caused by *acute liver atrophy or pneumonia*. Hence there are missing exactly such fatalities as are dreaded so much by the interns and practitioners. I observed a *mortality of 3.2 per cent.* with 211 cholecystectomies among which there were 35 with simultaneous choledochotomies for common duct obstruction by stone. Three cases died of peritonitis, among which there was one patient from whom the drainage tube was removed the next day by mistake, one patient died of pulmonary embolia after thrombosis of the vena saphena, and one patient died of simultaneous Basedow and hæmorrhage after gastroenterostomy.

With *cholecystectomy and choledochotomy* for common duct obstruction by stone the results are very satisfactory, since here I observed only two fatalities = 5.9 per cent. mortality among 34 cases. A woman, 65 years old, who 12 years previously was operated on at Hochenegg's clinic, died four weeks later of a subphrenic abscess. A man, 35 years old, who in January 1920, came in for operation in a condition of being starved on account of bad nourishment after war, died

15 days after choledochotomy and cholecystectomy from a hæmorrhagic diathesis with hæmatothorax and hæmatopericard. *Thus in spite of the long duration of the icterus and the high age* (there were four patients more than 60 years old) I observed a *mortality of only* 5.9 *per cent.* H. Lorenz, who always operates under deep general narcosis with Billroth's mixture, among 63 choledochotomies has 12 fatalities= 19 per cent. mortality of which there are two fatalities on the second day of cardiac insufficiency, one fatality of bilateral pneumonia. At the Hochenegg clinic, of 27 choledochotomies according to Bachrach there died seven patients=25.9 per cent. mortality. Pauchet had a mortality of 20 per cent. in early operations on cases with common duct stones; if, however, the icterus exists longer, the mortality will rise up to 60—80 per cent. Hence when comparing these figures it is obvious that local anæsthesia is having a favourable influence on the general results with operations for gall-stones.

Since *resection of the small intestine* is usually done for acute intestinal obstruction by incarceration, volvulus, etc., the duration of obstruction and the presence of a peritonitis will be competent for the prognosis. Local anæsthesia in such cases will be relatively simple as by injection of novocaine into the basis of the mesentery of the loops to be resected absolute painlessness can be attained. Up to now I have performed 121 resections of the small intestine under local anæsthesia, among which there are 67 resections of the small intestine, in cases of resection of a gastroenterostomy for ulcus pepticum jejuni or an unhealed stomach ulcer were made simultaneously with a stomach resection. Such cases are not included here. Among 54 resections of the small intestine there are eight fatalities, of which only one occurred soon after operation, on a woman, 76 years old, with a volvulus of almost the entire small intestine, four metres of which had to be resected for gangrene, and where the intestinal suture had to be made absolute because the point of resection was near the duodenum. In one case of a patient, 62 years old, I had to deal with a thrombosis of the vena meseraica and at the same time a *thrombosis of the vena portæ. Hæmorrhages into the adrenals* were observed in one case with an incarcerated hernia existing eight days. Three cases died of

peritonitis, having existed already at the time of the operation. In two cases the peritonitis issued from an already existing phlegmona of the hernial sac.

I have here also no pneumonia fatality, although of 18 patients more than one-third were over 60 years old. Nine patients were 70—81 years old. *Of these latter only one patient died,* viz., the previously mentioned woman who was 76 years old and suffering from volvulus and gangrene of almost the entire small intestine, whereas the rest of the cases recovered, among whom there was a man, 81 years old, who was sent for operation by the internal physician with the diagnosis of chronic obstruction in consequence of a cancer of the cæcum, where, however, no cancer was found but only a partial obstruction by numerous adhesions of the small intestine in an otherwise replaceable umbilical hernia. In order to remove the stenosis 40 cm. of the entirely adherent small intestine were resected, and after four years the patient is free from any trouble.

In *resection of the colon,* only in cases of resection of the movable flexura sigmoidea conductive anæsthesia of the abdominal walls and the injection of novocaine into the mesosigma will be sufficient, whereas for the resection of the fixed colon ascendens and descendens the peritoneum of the posterior abdominal wall must be anæsthetised by the *paravertebral conductive anæsthesia* unless you prefer to apply a short ether narcosis, or still better, a nitrous-oxide narcosis for the short stage of mobilising the colon and the flexura hepatica or lienalis, and thereafter to inject immediately novocaine into the basis of the mesocolon so that the resection and the intestinal suture are performed entirely without any general narcosis. In this manner also the suture of the colon can be made so exactly that it will hold under all circumstances. I almost always use the side-to-side anastomosis with an opening of at least three fingers wide, and then I make a suture of three layers. Though I made the primary suture also in the acute occlusion, I have never seen an insufficient suture with the lateral anastomosis while the circular suture did burst in one case. Also here it is of great importance that there is no intestinal atony since it would endanger more particularly the circular colon suture.

Among 42 resections of the cæcum and the ascending colon six cases died, which is equal to a *mortality of* 14.2 *per cent.* Among 57 resections of the colon descendens and the flexura sigmoidea there were four fatalities=*a mortality of* 7.1 *per cent.* The considerably higher mortality with cæcum resection is explained by the fact that here the primary intestinal suture one-stage resection was also made in the subacute occlusion, whereas with the resection of the colon descendens at this stage the ends of the intestine were sutured in to the anus præternaturalis (two-stage resection).

With the *abdomino-sacral operation* (at first laparotomy, then sacral operation according to Kraske) for cancer of the colon pelvinum and high situated cancer of the rectum, it is of special importance to abandon deep general narcosis. This operation until recently showed an exceedingly high mortality. At Hochenegg's clinic, according to Mandl, it amounts to 52 per cent., and at Payer's clinic, according to Pribram, it amounts to 61 per cent. The majority of fatalities occur immediately after the operation of so-called *operation shock* or cardiac collapse. In the *Archiv. für Chirurgie,* vol. 131, published in honour of von Hacker, I wrote an article which proves that these fatalities can be avoided entirely by the extended parasacral anæsthesia as described by me in *Zentralb. f. Chir.,* 1922, p. 1552. If, besides, *wound infection* is excluded by a preparatory colostomy, it will no more be necessary to desist from the continence and to make an anus iliacus, but we may perform the circular suture in the sacral wound without any increased danger.

Among 28 abdomino-sacral operations for carcinoma I have seven fatalities=25 *per cent. mortality.* Most of them are due to wound infection because colostomy was not performed beforehand. Both fatalities subsequent to the operation concern cancers of the rectum entirely fixed onto the sacrum so that a parasacral anæsthesia was impossible, and only the local anæsthesia of the abdominal walls could be performed, whereas for the rest it became necessary to apply ether narcosis. The one case ten months previously had been declared to be inoperable and colostomy performed on it. On account of the unbearable pains in spite of great doses of morphia (0.5 pro inj.=about 9 grains), the patient absolutely

asked for the operation as otherwise he would commit suicide. In the second case when removing the cancer which was adhering fast to the os sacrum a severe hæmorrhage was noticed which only ceased after the removal of the tumour.

If *wound infections* will be excluded by previous colostomy and *fatalities of operation shock* are avoided by local anæsthesia, it may be hoped that in future also this operation can be applied more frequently and successfully.

The examples cited should prove that the kind of anæsthesia is of an essential importance for the results of major abdominal operations. Surely also here improvements will be possible. It is hoped that the methods of anæsthesia will develop further and that a more efficient remedy which at the same time is less dangerous will be found both for local anæsthesia and for supporting general narcosis. According to the experiences up to now tutokaine, made by Bayer & Co. at Leverkusen (Germany), having a full efficiency and a less toxicity at a solution of 0.2 per cent., signifies notable progress, especially with splanchnic anæsthesia. Ethylene and narcylene as supporting means for local anæsthesia in cases of combined anæsthesia require still further experiences. The best results according to my own experiences may be expected from a nitrous-oxide narcosis in combination with a conductive anæsthesia performed exactly according to the rules in case that the latter alone should not be sufficient. If nitrous-oxide is not available, ether must be applied in little quantities. At the same time it will be necessary that the anæsthetist is experienced also in such combined anæsthesia as otherwise he is likely to use unnecessarily much ether.

Patients should be told that major operations may be performed entirely painlessly without general narcosis, thus considerably improving the ultimate results of operation. The surgeon should also, prior to the operation, explain to each patient the expediency and advantages of the different methods of anæsthesia in order that the patient, understanding the dangers of an operation under deep general narcosis, will not refuse the performance of local anæsthesia.

In cases where the operation, on account of its extension, cannot be performed painlessly under local anæsthesia only, an exact conductive anæsthesia of the abdominal walls should

be applied as well as injection of novocaine into the mesenteries, since thereby the quantity of the narcotic used in support will take so little that it can hardly do any harm. For the present the best results may be expected from the combination of local anæsthesia with a temporarily performed nitrous-oxide narcosis, which procedure is of special good service with very nervous patients.

Reprints of the following articles by Prof. Dr. H. Finisterer are in the possession of the *British Journal of Anæsthesia*, and subscribers interested may borrow same :—

Die Splanchnicusanästhesie bei grosen Bauchoperationen.
Die Bedeutung der Lokalanästhesie (erweiterte parasakrale Anästhesie) für die Radikaloperation des Carcinoms des Colon pelvinum.
Parasakrale Anästhesie bei der Radikaloperation des Rektumkarzinoms.
Lokalanästhesie mit Tutocain bei Grosen Bauchoperationen.
Zur Technik der paravertebralen Leitungsanästhesie.
Ueber die Bedeutung der Anästhesie für den Verlauf der Laparotomien.
Nochmals zur Frage der Lokalanästhesie bei den grosen Bauchoperationem.
Der Wert der Lokalanästhesie bei den grosen Bauchoperationem.
Arteriomesenterialer Duodenalverschlus und akute Magendilatation.
Zur Frage der Lokalanästhesie in der Bauchchirurgie.
Zur Indikationsstellung bei akuten Magenund Duodenalblutungen.
Offizielles Protokoll der Gessellschaft der Aerzte in Wien (3), March, 1914, Oct., 1916, and May, 1920.
Lokalanästhesie bei Appendicitisoperationem.
Lokalanästhesie und Allgemeinnarkose.
Der Einflus der Lokalanästhesie auf die Indikationsstellung und die Operationserfolge.
Dauererfolge bei der Resektion des Magenkarzinoms.
Chirurgische Erfahrungen in Amerika.
Lokalanästhesie bei Magenoperationen (Gastroenterostomien, Resektionen).

THE ALLEGED INCONVENIENCES OF LOCAL ANÆSTHESIA WITH NOVOCAINE.*

By Dr. R. Riccio and Dr. F. Buonomo la Rossa, Naples.

Another operation through which various fatal cases occur in the literature is tonsillotomy. Of the twenty reported by Mayer there is only one of local anæsthesia with novocaine and adrenaline; all the others are in association with cocaine in strong solution (10 to 20 per cent.) Blegond's cases comprise one of his own and five reported by Mayer, Schiltern, Sonnenschein, Becker, and Simpson, but we have no particulars, In all a solution of ½ to 1 per cent. novocaine up to 4 per cent. was used with adrenaline. The fatal cases of tonsillectomy show the toxic action of cocaine used in strong concentration (20 per cent.); in the cases in which novocaine was used alone attention shall be given to the respective methods and to the topography of the region. Blegond gives some fatal cases with incomplete details; there are three of splanchnic anæsthesia (Denk and Heller), a prostatectomy (Wright), and a subcutaneous injection (Schoemaker) with 12 cc. of novocaine. The first three suggest lesions of the suprarenal capsule and of the pleura; the fourth concerns intraperitoneal injection; the last is perhaps a case unique in the literature of idiosyncracy.

In order to pursue our inquiry we have interrogated a large number of surgeons (124), both general surgeons and specialists (dentists, aurists, rhinologists, oculists, urologists, etc.). Our inquiry was of a regional character, but hitherto we have found in Italy no published fatal cases, and no surgeon has reported mortal dangers attending local anæsthesia with novocaine.

* Continued from the January Number.

The results of our inquiry are arranged as under:—

Secondary disturbances:

General.—Slight collapse, 7; tachycardia, 2; rise of temperature, 2; headache, 2; vomiting, 2; excitement, 3.

Local.—Necrosis, 14; secondary hæmorrhage, 11.

Phenomena of transitory intoxication, 0.

Fatal poisoning, 1.

Necrosis.—1. Epithelium of upper lip, 1; 2. removal of small tumour, 1; 3. plastic skin (face), 2; 4. abscess of, 2; 5. removal of small tumour of hand, 1; 6. ditto, 7. keloid of leg, 1; 8. tooth extraction, 2; 9. inguinal hernia, 2; 10. phimosis and œdema of prepuce, 1.

These operations range from that on a girl of fifteen years to that of a woman of sixty, with no particular contra-indication, and all in the best conditions of health. The solution used was ½ to 2 per cent. (as in case 7) with adrenaline. The cause of necrosis, which was always limited to skin and subcutaneous tissues, is not to be found in novocaine but in adrenaline and its vaso-constricting action. This effect is heightened by the use of too rigorous technique of the injection: by making the injection too superficially; by making it into tissues affected by inflammation and congestion (case 4), where the process may be easily diffused, by using the altered solution (cases 1 and 2), finally by injecting tissues poorly supplied with blood and too compressed (case 5). Some have occurred with adrenaline, cocaine having no vaso-dilating effect.

Many authors (Cavina, etc.) exclude the possibility of such inconveniences, others regard them as trifling. Ten per cent. of the surgeons we consulted were little enthusiastic about adrenaline, because of the vaso-dilation which follows its primary vaso-constricting action. B. Falcone, director of the Civil Hospital at Cosenza, writes as follows: "I have given up adrenaline, which I used to use with novocaine, because of cases of secondary hæmorrhage; in one case there was a hæmatoma which necessitated removal of sutures; in a cancer of the tongue I had an alarming hæmorrhage in which it was

necessary to use ligatures." These hæmorrhages are independent of age, of the site of operation and of any particular state of health. In the above-mentioned operations the agent employed was a solution of ½ to 1 or 2 per cent. with adrenaline.

Collapse. In five cases the symptoms were slight and transitory (3—4 minutes), consisting of nausea, sweating, pallor, rapid pulse, feelings of uneasiness, and in one instance vomiting. We have divided these disturbances into two classes, those in the first depending simply on the puncture, those in the second on the anæsthetic. Of the first we have no suitable example, of the second we have quite a solitary case of the removal of a lipoma from the neck in a woman of fifty years, anæsthetised with 30 cc. of a 1 per cent. solution with adrenaline; in such a case we may expect a special sensibility. To prevent these disturbances it is advisable always to make the injections into the patient horizontal. Two or three cases of vomiting, of very short duration, occurred when anæsthesia was instituted with a full stomach; plentiful evidence of the full state of the stomach was provided by lettuce, chocolate, eggs, etc. In certain individuals, apparently of peculiar sensibility, there has been violent headache; this event is perhaps attributable to the adrenaline.

Three cases are reported of violent excitement; one in an operation on a finger for Whitlow, two in extraction of teeth, suddenly after the injection and at the beginning of operation. The cause may be suggested, as all three cases were women, to lie in a hysterical attack. Two of the patients had a 1 per cent. solution with adrenaline and one a synthetic preparation.

Some surgeons have communicated cases in which a temperature of 39° C. with quick small pulse lasted three or four days after the operation for inguinal hernia; a 0.5 per cent. solution of Meister-Lucius novocaine was used with a drop of adrenaline per 100 gr. of the anæsthetic solution. The question of technique arises in these cases and the possibility of peritoneal irritation.

There remains for consideration the fatal case. It concerns a baby of twelve months with an angioma, the size of a small orange, on the right breast, and apparently otherwise healthy. Four injections were made around the tumour, the solution

used being a compound of novocaine, stovaine and adrenaline with maximum amounts of gr. 0,08 novocaine, 0,04 stovaine and 0,002 adrenaline made in soluble colloid and in a special physiological flask. After the last drop of injection, and at the beginning of the operation, the little patient became cyanotic, first at the lips and then at the extremities, the respiration shallowed, and the pulse rapid. After a few minutes breathing ceased and death ensued eighteen minutes after the first injection of the anæsthetic. The death was caused, in our opinion, by novocaine and adrenaline. The technique practised was unsuitable to a small child ill-adapted to local injections, and adrenaline was used in the vicinity of an angioma where it may well enter a vein and go direct to the circulation. Schwartz used local anæsthesia for twenty-five years, but never employed anæsthetic injection for children under twelve years.

To recapitulate, our inquiry has demonstrated the perfect safety of the method so long as precise regulation of the technique is observed.

Novocaine remains always, as Braun felicitously wrote, as the ideal of local anæsthetics. To free local anæsthesia from all risks and inconveniences it is necessary to take care—

(1) Of the temperature of the operating room.

(2) The patient should not be fasting.

(3) Children under ten years of age should not be treated with anæsthetic injections.

(4) Preparatory injections with morphia, scopolamine, etc., are to be avoided.

(5) Anæsthesia should be instituted in the horizontal posture.

(6) Synthetic preparations should not be used, but the solution should be freshly prepared.

(7) An isotonic solution of novocaine, 1 per cent. with chloride of sodium, should be used without adrenaline—the maximum dose to be 100 cc. If adrenaline is to be used the cardio-vascular apparatus of the patient must be watched. The adrenaline must be provided in a sterilized vessel and added in the ratio of 5—10 drops per 100 cc. of the solution.

(8) The solution must be injected at the temperature of the body.

(9) The injection must be made from a glass, not from a metal, syringe.

(10) The injection is to be made slowly and at low pressure.

(11) The injection should not be too superficial, but should be made into the connective and submucous tissues.

(12) Inflammatory sites are to be avoided, regional local anæsthesia being employed.

(13) If at the beginning of anæsthesia the patient grows pale the injection is to be stopped.

(14) Paravertebral anæsthesia in the cervical region should not be made with more than 50 cc. of the solution.

Initial collapse is treated by injection of camphor, caffeine, strychnine, sparteine and alcohol; if necessary to these must be added inhalations of oxygen and artificial respiration.

BIBLIOGRAPHY.

Allen, C. "Local and regional anæsthesia." W. B. Saunders, Philadelphia, 1920.

Braun, H. "Die örtliche Betäubung." J. A. Barth, Leipzig, 1921.

—— "Die Grenzen der örtlichen Betäubung." *Arch. f. klin. Chir.*, 1921. Bd. 116, p. 184.

Blegvad, N. R. "Les avantages, les inconvénients et les dangers de l'anesthésie locale en oto-rhino-laryngologie." *Revue de Laryngologie, n.* 5, 1924, p. 145.

Camus. "Action de la stovaine et de la novocaine sur les centres bulbaires." *Paris Médical*, 1922, p. 205.

Cavina, C. "L'anestesia locale in chirurgia dentale." Relaz. al XI congr. stomatol. ital. Roma, 1922.

Ciaprini, G. "Contributo clinico-statistico sulle rachianestesie ed anestesie locali praticate presso l'Infermeria presidiaria di Aquila." *Il policlinico, Sez. pratica*, n. 4, 1923, p. 111.

De Quervain, F. "La mortalité de l'opération du goitre simple." *La Presse médicale*, n. 7, 1924, p. 69.

Drüner, L. "Ueber die Leitungsanästhesie dei Bauchoperationen." *Zentralb. f. Chir.*, 1921, p. 1245.

Eidens, R. "Tod nach Novocainanästhesie." *Arch. f. klin. Chir.*, Bd. 1923, 122, p. 603.

Eineke, O., and Läwen, A. "Experimentelle Untersuchungen und klinische Erfahrungen ueber die Verwertbarkeit von Novocain

für die örtliche Anästhesie." *Deut. Zeits. f. Chir.*, 1905, Bd. 80, p. 180.

Eves, C. C. "Local anæsthesia, precautions in using." Report of Death. *Annals of Otology, Rhinology and Laryngology*, Sept., 1923.

Fischer, G. "Die örtliche Betäubung in der Zahnheilkunde." Meusser, Berlin, 1920.

Härtel, F. "Die Lokalanästhesie." Enke, Stuttgart, 1920.

Holm, G. "Ueber unglückliche Zufälle bei paravertebraler Leitunsanästhesie am Hals." *Acta chir. Scandinavica*, vol. 53, p. 21.

Kulenkampff, D. "Die Technik der örtlichen Betäubung bei Halsoperationen." *Zentralb. f. Chir.*, 1921, p. 1262.

Muroya, S. "Experimentelle Untersuchungen ueber Novocain bei Paravertebralinjektion." *Deut. Zeits. f. Chir.*, 1913, Bd. 122, p. 1.

Pauchet, V., Sourdat, P., and Labat, G. "L'Anesthésie régionale." G. Doin, Paris, 1921.

Mayer, E. "The toxic effects following the use of local anæsthetics, an analysis of the reports of forty-three deaths submitted to the Committee for the study of the toxic effects of local anæsthetics of the American Medical Association." *The Journ. of the Amer. Med. Assoc.*, 1924, vol. 82, n. 11.

Reylier, C. "De la novocaine." *Bull. de l'Acad. de Méd. de Paris*, 1907, p. 484.

Riccio, R., and Buonomo la Rossa, F. "Note di anestesia regionale." Ediz. della "Rassegna Internazionale di Clinica e Terapia," Napoli, 1923.

Ritter, C. "Totalanästhesie durch Injection von Localanæsthetika ins Blut." *Arch. f. klin. Chir.*, 1909, Bd. 96, p. 928.

Schiassi, B. "Anestesie chirurgiche regionali-locali." Relaz. al XXIV Congr. ital di Chirurgia, 2a parte, Roma, 1912.

Soupault, R. "Dissociation des centres bulbaires par la novocaine chez l'homme." *La Presse Médicale*, 1923, n. 33, p. 379.

Wiedhopf, O. "Die Neben-und Nachwirkungen der örtlichen Betäubung." *Deut. Zeits. Chir.*, 1921, Bd. 167, p. 392.

ACETYLENE-OXYGEN ANÆSTHESIA.*

By Dr. AARON GOLDMAN and Dr. JULIUS D. GOLDMAN.

Acetylene and Ether—one basic difference. Acetylene and nitrous-oxide affect, as anæsthetic, organisms that depend upon oxygen-ærobic. Ether, chloroform, and ethyl chloride affect both ærobic and anærobic life.

Acetylene solubility in the blood—comparisons with nitrous oxide, with ethylene, and with nitrogen. Nitrogen has a low solubility in the blood—four volumes per hundred. If we replace the nitrogen in the air with another indifferent gas of sufficiently high solubility—nitrous-oxide, and continue the normal oxygen content, we must increase the pressure above one atmosphere to secure anæsthesia—as Paul Bert showed in 1878. Somehow many of the German writers overlook the fact that by properly reducing the oxygen percentage, anæsthesia may be maintained for a long time without producing any ill-effects by this reduction. (The nitrogen when substituted with a gas of higher solubility—ethylene—we can secure anæsthesia with percentages at times equal to nearly that in the air.) Acetylene is of still higher solubility—75 volumes per hundred at the body temperature (Rudolf Schoen, *Z. f. Physiol.*, Ch. 127, 1924).

Gauss-Wieland Technique. Substituting the nitrogen of the air by acetylene we can commence the anæsthesia and increase the 20 per cent. oxygen in one minute to 30 per cent. Anæsthesia appears in less than one minute. Thereafter about every five minutes the oxygen may be increased 5 per cent. In the second half hour 70 per cent. oxygen may be reached, at which it generally remains until the end of the narcosis. If signs of waking appear, decrease the oxygen to 30 per cent. for one minute. Wieland writes that with this

* Continued from the January Number.

procedure at the Frauenklinik in Berlin up to a few months ago, Gauss had already performed over 2,000 operations lasting from three minutes to over three hours. Signs of asphyxia are always absent—the patients appear to be in a sound, healthy, pleasant sleep. Return to consciousness is very rapid. The patients give their names or stick out their tongues upon request, in one minute.

Action of acetylene in the body—during and after anæsthesia.

(1) What is the rate at which the blood takes up the acetylene?
(2) Is the absorption of oxygen by the blood effected by the presence of acetylene?
(3) At the end of the narcosis at what rate is the acetylene eliminated?

Schoen and Sliwka (*Z. f. physiol.*, ch. 131, 1923) have shown that with the above technique the rate of saturation of the blood is very rapid. In the first five minutes 88 per cent. saturation has been reached. In seventeen minutes complete saturation comes. Their research has further explained the speedy recovery. In one minute after the administration 85 per cent. of the acetylene has been eliminated. In twenty minutes every trace of acetylene has disappeared from the blood. These findings upon rabbits agree with those of Grehant (1895) upon dogs. Grehant states that 99 per cent. of the acetylene disappeared in the first ten minutes—in thirty none was demonstrable in the blood.

These findings and others which we shall refer to have been corroborated by frequent tests upon the blood of patients during operations. Rudolf Schoen (*Z. f. Physiol.*, ch. 127 1923), has now firmly established the fact that acetylene enters into no chemical combination with blood! Even Manchot's theory of a loose chemical combination at certain temperatures has been proven false. Acetylene acts no less indifferently in the blood than does nitrogen. Wieland has taught (*Arch. f. Exp. Pathol.*, Bd. 92, S. 96, 1922) that the taking up of oxygen was interfered with by the presence of acetylene. Schoen states that the oxygen absorption by the blood is in

no way interfered with by the presence of acetylene. (How are we to explain the dangers above 80 per cent. acetylene concentration?) Hermann's statement, made in 1870, that acetylene and blood enter into only a physical solution has been corroborated.

Why so much oxygen? Does ethylene demand higher oxygen percentage, or does it permit higher oxygen percentage for anæsthesia than does nitrous-oxide? Does acetylene demand higher oxygen percentage or does it permit higher oxygen percentage for anæsthesia than does ethylene?

We stated above as one of our conclusions that with acetylene " if a proportion of oxygen is given equal to that which, with nitrous-oxide gives anæsthesia the life of the animal is quickly endangered; death comes quickly." We may state further that if eight per cent. oxygen and ninety-two per cent. nitrous-oxide gives anæsthesia, the same percentage of oxygen with ethylene brings death. Further, if twelve per cent. oxygen and 88 per cent. ethylene gives anæsthesia the same percentage of oxygen with acetylene brings death. We can come to but one conclusion. Ethylene is not as innocuous as nitrous-oxide. Acetylene is not as innocuous as ethylene. We await further laboratory findings.

In some experiments upon white mice held at the Long Island laboratories of the Union Carbide and Carbon Company, the average percentage of oxygen was ten per cent. with acetylene, the anæsthesia lasting one hour or more. Wieland says: " I cannot help thinking that in the making of your gas mixtures or in the analyses an error has crept in—in my experience a mixture which contains over 85 per cent. of acetylene is in the case of the mouse absolutely and within a few minutes deadly."

What is an indifferent gas? A critical study of the facts thus far presented brings us to certain conclusions at marked variance with our German confréres. They tell us that acetylene acts as indifferently in the blood as does nitrogen. Other investigators have informed us that ethylene is as indifferent a gas as is nitrous-oxide. Our facts do not bear out these conclusions. We do not believe that ethylene is as indifferent as nitrous-oxide. It appears to us that were acetylene, ethy-

lene and nitrous-oxide equally indifferent, the organism would tolerate each of them with an equally low percentage of oxygen death would not come with ethylene at 92 per cent. concentration. Death would not come with acetylene at 85 per cent. concentration. We have placed especial emphasis upon these points because we believe no sound theory of anæsthesia can overlook them.

Acetylene-oxygen innocuous. That ether and chloroform have definite toxic effects upon the tissues is nowhere questioned. As Solbach points out there is a well grounded fear for repeating the anæsthesia within short intervals—the danger of imposing a second toxic dose upon the not yet innocuous first. No such danger presents itself with acetylene. The rapid elimination coupled with the absence of any chemical combination with blood or other tissue-elements explains this. Solbach reports that of 1,000 cases, 111 were anæsthetized twice; 45, three times; 6, four times; 3, five times; 2, six times, and 1, seven times within short intervals. Of the 111, the second narcosis occurred, frequently. the same day, generally the next. Furthermore, they considered the anæsthetic so innocuous that much more was done at one anæsthesia than would be dared with ether and chloroform. Twenty-eight were of over two hours, the longest three hours thirty minutes. The after-effects after a very prolonged anæsthesia are the same as after a short one.

Fire and explosion hazard. In the discussion of acetylene, as in that of ethylene, much has been made of the fire and explosion hazards. A box of matches is frequently present in an operating room—no one would think of applying a flame to it. Although it has not frequently been remarked, it is, nevetheless, true that ether is as great or greater a hazard than acetylene. In a badly ventilated ordinary operating room, such is the diffusibility of the gas that after a very long anæsthesia, less than one half of one per cent. concentration can be reached. Acetylene may explode only in concentration of 3 to 53 per cent., when touched with a flame or spark.

Re-breathing. Our literature on nitrous-oxide and ethylene teems with general statements upon the advantages of

re-breathing, and upon the beneficial effects of the added carbon dioxide stimulation of the respiratory centre, and its action upon the oxyhæmoglobin to stimulate the oxygen to more readily pass to the tissues. We are anxious, however, to obtain charts giving the carbon dioxide concentrations in the blood during nitrous-oxide and oxygen and ethylene and oxygen anæsthesia. In the use of acetylene-oxygen we believe the Germans do not take advantage of re-breathing. None of their acetylene literature mentions re-breathing. Their apparatus has no arrangement for it. The manufacturers of Narcylen in a letter to us dated Hamburg, October 4, 1924, ask : " Is re-breathing usual in all nitrous-oxide-oxygen narcoses, or only in some, or is it no more regularly used? I would like to have similar information in regard to ethylene."

Apnœa. Some of the writers mention the occurrence of apnœa—which at times lasts forty seconds. Solbach and Hazelhorst speak of apnœa appearing in many cases. However, with this stoppage of breathing the appearance of the patient is always so splendid as not to arouse concern even in a novice. Probably the most thorough explanation of this phenomenon, due to decreased carbon dioxide stimulation of the respiratory centre, is given by Haldane in his work on " Respiration," published in 1922. During acetylene-oxygen anæsthesia we have noted the marked carbon dioxide variation. Is it not probable that this and the stoppageof breathing may be avoided by properly regulated re-breathing? This is, however, not as easily done as said. One of the outstanding virtues in the Gauss-Wieland technique is the accurate measurement of oxygen and acetylene percentages. Can we have a sufficiently sensitive regulating device to determine the oxygen-acetylene percentages in regulated re-breathing?

ABSTRACTS OF CURRENT ANÆSTHETIC LITERATURE.

Spinal anæsthesia by stovaine. ROBERT E. COLEMAN, Church Missionary Hospital, Old Cairo, Egypt. *Brit. Med. Journ.*, March 21, 1925.

Dr. Coleman gives a summary of the last 2,000 cases in which this method was used, covering a very wide range of operations. The ampoules supplied by Parke, Davis & Co. consist of stovaine 0.1 gram, sodium chloride 0.1 gram, sterile distilled water to 1 ccm. In making the puncture he allows as little fluid as possible to escape. He thinks less headache is seen in such cases.

In 5,000 cases there was but one death—a case of strangulated hernia in very poor condition at time of operation. As soon as the stovaine was injected he collapsed and died. Dr. Coleman never saw a case of paralysis or paresis. The slight nausea occasionally noticed is controlled by a spoonful of brandy with a little water given by the mouth.

Splanchnic anæsthesia: an analysis of forty-two cases. WM. R. MEEKER. *Archives of Surgery*, March, 1925.

Dr. Meeker does not seem to have been favourably impressed with his experiences in this series of cases. At the Mayo Clinic the posterior route of approach was used, *i.e.*, the method of Kappis, because it is easier and safer than the anterior method employed by Braun.

The abdominal wall was first anæsthetised by field block according to Braun's method, which produces complete relaxation of the recti muscles. In the forty-two cases reviewed pain and discomfort were experienced at some time in most of the series, although Meeker admits that the size of the preliminary dose of morphine was only one-sixth of a grain, and scopolamine one-two hundredth of a grain, and that no barbital or bromides were given the night before as is the custom on the Continent. He admits also that the quantity of solution of procaine employed was less than employed by Europeans, and prefers 30 cc. of a 0.5 gm. solution as being a maximal dose. He asserts that the proposition that local anæsthesia is entirely safe is too freely accepted, and prefers for poor surgical risks local infiltration, or field block for laparotomies, supplemented by a short inhalation narcosis, preferably ethylene-oxygen, for intra-abdominal work if needed.

President's address, American Society of Regional Anæsthesia, Gaston Labat; Current Researches in Anæsthesia and Analgesia, Feb., 1925.

Dr. Labat gives a long list of operations in which he urges the desirability of regional anæsthesia. He states that the injection of the Gasserian ganglion gives a sufficiently wide operative field for the resection of the posterior root of the trigeminal nerve. If this is associated with a first stage narcosis, the discomfort of the patient

due to bone resection is prevented and the section of the nerve is not attended by reaction of the brain. Resection of one of the vocal cords for carcinoma resembles a clean dissection on the cadaver when done under regional anæsthesia and the post-operative results are simply marvellous when the correct technique is used. Blocking the brachial plexus is easily and quickly accomplished for all operations on the upper extremity. It improves the condition of shock in traumatic surgery; facilitates manipulations for X-ray examinations and reductions of fractures and dislocations. The state of consciousness is here of the highest value, especially for sutures of tendons, because the patient can co-operate actively with the surgeon. Splanchnic analgesia is still in its infancy and needs delicate care and special attention. Spinal anæsthesia, which is an extensive regional nerve-block, finds useful application in the surgery of the abdomen, pelvis and lower extremities. It can render most valuable services when the paravertebral and sacral block procedures are not likely to reach the desired aim. But it is of the highest importance that these methods be studied very closely and not merely attempted at random. They should be studied not only for the sake of being utilized in selected cases, but with a view to knowing how to use them in such cases with the greatest advantage.

Regional anæsthesia in over four hundred major operations at the Ashland Clinic, Kentucky. J. W. Stephenson, Et al. *Current Researches in Anæsthesia and Analgesia*, Feb., 1925.

These writers have developed a method of field block in appendectomies which differs somewhat from that employed by others. For the past six months they have injected through a wheal two finger breadths to the inner side and slightly above the anterior superior spine, in this way blocking the ilio-inguinal, ilio-hypogastric and twelfth intercostal nerves, followed by a subcutaneous injection almost quadrilateral in shape which takes in the outer half of the rectus muscle, enclosing the field of operation. No other deep injections are made except at a point near the outer border of the right rectus which blocks the terminal fibres of the eleventh intercostal nerve. They then make a transverse incision through the skin, superficial fascia and the fascia of the external oblique, followed by a splitting of the oblique and transverse muscles. This incision is used to gain more space without too much trauma from retractors. After the peritoneum is opened, it is blocked from within with a one-half per cent. solution of neocaine, to which occasionally they add a one-fifth per cent. of quinine and urea hydrochloride. In using this transverse incision, one may open the sheath of the rectus and roll the muscle towards the median line, which procedure will give all the space required for any operation upon the appendix, cæcum or terminal end of the ilium. In all cases, whether simple or complicated, they block the meso-appendix, which will permit clamping and ligating without pain unless there is too much pulling, involving the deeper structures.

Pre-operative digitalization—a method to reduce post-operative complications. S. H. GEIST and M. A. GOLDBERGER. Same Journal.

As a preliminary to their experiments they found in a series of blood-pressure readings an average drop of 14.2 mm. of mercury one hour after operation. It took 24 hours for this to return to normal. In the digitalized group the drop in pressure averaged only 3 mm. in the first 12 hours. The method employed is to give one tablet of digitan (grain 1½) for each 15 pounds of body-weight. These are given by mouth, one tablet or two every two hours, starting 24 hours before operation, and continued until the entire amount has been exhibited. On the morning of the operation two more tablets may be given. The effects last 10 to 14 days. In the 226 digitalized cases they had only one post-operative pneumonia.

The low cervical Cæsarean section under local anæsthesia. JOSEPH B. DE LEE. *Surg., Gyn. and Obstet.*, Chicago, Feb., 1925.

At De Lee's hospital (Chicago Lying-in) 67 low cervical sections were done under local anæsthesia, of which 39 were completed under novocaine alone. He thinks local anæsthesia reduces the incidence of all factors making for a febrile recovery. He asserts that novocaine should not be used in concentrations stronger than one per cent., though his dosage was in concentrations of even less than 0.5 per cent. The amount of epinephrin should never exceed a total dosage of one milligram, and if the patient has hyperthyroidism the limit is one half of this amount.

Glucose to protect against chloroform. O. F. MAZZINI. *Prensa Medica*, Buenos Aires, Jan. 10, 1925.

Mazzini, as a result of a series of experiments, concludes that chloroform should not be given to patients who have been fasting, until they have received injections of hypertonic solutions as well as plenty of water to drink. He demonstrated that chloroform caused strong toxic effects on fasting animals in inverse proportion to the glycogen content of the liver. He overcame this by the administration of glucose to the fasting animals before anæsthesia. Glucose following the use of chloroform had no effect.

Spinal anæsthesia. D. A. ORTH. *Am. Jl. of Surg.*, Quarterly Anæsthesia Supplement, New York, Jan., 1925.

Just before operation the patient is blindfolded and quietly moved to the operating room. He is placed on his right side, his back is asepticized with benzine, followed by a 4 per cent. tincture of iodine, which is washed off with 95 per cent. alcohol. The field is protected by sterile towels, the operator, after observing strict aseptic precautions, identifies his landmarks by placing a towel from crest to crest of ilium, which is on a line with the centre of the body of the fourth lumbar vertebra, and injects the skin at the site of puncture with a two per cent. solution of apothesine. An assistant lends aid by holding the patient's legs and head in such a way that the back is bent

to increase the space between the lumbar spinal processes (the Katzen-Puckel of the Germans). The needle is introduced about one-half inch to the side of the middle line and *not in the middle*, so as to avoid the extra-dural plexus of veins which are in the middle line. Enough cerebro-spinal fluid is withdrawn to equal the amount of apothesine solution to be injected.

Minimizing the patient's risk in surgery and obstetrics. Same Journal. GILBERT FITZPATRICK.

The author states that if a patient shows either acetone bodies in the urine; or a relative excess of ammonia compared with urea; or of ammonia with acidity, especially when coupled with traces of sugar, showing carbohydrate intolerance, and perhaps also a marked indicanuria in urine of not high specific gravity, he (or she) is exhibiting marked metabolic disturbances and is a poor anæsthetic, obstetric and surgical risk.

Some lung complications connected with gastric surgery. X. DELORE, L. MICHON and E. POLLOSSON. *La Presse Medicale,* 20 Sept., 1924.

Quite a number of lung complications occur after operations upon the stomach. In spite of perfected technique and of better understood indications for operation of late, such complications continue to present real difficulties. The question should be made a topic of discussion at surgical congress.

Ignorance as to the true pathological nature of these complications is a stumbling block. The theory of septic embolism arising in the gastric mucous membrane is plausible, but has not been proved to be the only explanation. Some authorities believe in a nervous origin and attach importance to a reflex inhibition, made possible by the relationship between the gastric and pulmonary branches of the vagus. Among the principal points which seem worthy of consideration in this connection are the following :—

1. *Precautions before operation.* Of these the most important is lavage of the stomach which we perform systematically once or twice before operation—it seems to act mechanically by emptying the organ and relieving congestion, for which reason we use water without any antiseptic. When time permits we have the mouth attended to by a dentist.

2. *Precautions at time of operation.* The method of anæsthetising. We do not consider this to be a factor of paramount importance, and as far as our experience has gone the abandonment of inhalation anæsthesia in favour of local analgesia made no difference in the incidence of chest complications, in fact some authorities find that these sequelæ follow " local " and " spinal " as often as or oftener than they follow " inhalation."

We would insist on the necessity for extreme gentleness in gastric surgery. Manipulations in the upper abdomen are particularly liable to give rise to septic emboli which result in pulmonary complications. The fact of operating in a region known to be septic, with thrombosed

venules, should call for the most careful operative manipulation. For this reason we carefully avoid traction on the mesentery and pressure on the intestine by rough handling or by instrumental bruising; we use neither clamps nor crushing forceps and often we use bare hands for exploring so as to preserve delicacy of touch and avoid trauma. It is all important to avoid creating small hæmatomata in the omentum—if these occur they will almost certainly be followed by lung trouble.

After operation. We insist on complete rest for 10 or 12 days, and on the slightest evidence of chest trouble we administer oxygen and poultices. As to stomach lavage we employ it largely, not limiting its use to cases of vomiting or hæmorrhage but employing it when there is flatulence, slight fever or rapid pulse, and we are convinced that this practice tends to prevent pulmonary complications.

A. L. FLEMMING.

The control of the fall of blood pressure during splanchnic anæsthesia by pituglandol. W. HARNE. *Zentralblatt für Chirurgie*, 1925, No. 11, p. 565.

Cutting the splanchnic nerves in animals is followed by a considerable fall of blood pressure (B.P.F.), which is explained as being due to paralysis of the vaso-constrictors of the intestinal vessels. Many consider that this explanation holds good for splanchnic anæsthesia. The majority of writers ascribe the B.P.F. to novocaine poisoning. Metge observed marked filling of the mesenteric veins in only one-fifth of his cases. Schilf-Ziegner adopt the splanchnic-paralysis theory, both for splanchnic and lumbar anæsthesia. Harke, working in Prof. Kappis' clinic, argues that if this view is correct a complete bilateral splanchnic block should always be followed by serious incidents. This is not the case, although as a rule there is a distinct, often considerable and at times a severe B.P.F. Harke found this fall both with Braun's and with Kappis' technique. It constitutes a considerable disadvantage of the method, and an effective antidote is needed. Digitalis, strychnine, caffein, adrenaline, etc., were tried but unsuccessfully. Pituglandol, however, which is a 10 per cent. extract of the infundibular part of the hypophysis and according to Biedl constricts blood vessels and slows and strengthens the heart-beat, gave extraordinary results in a series of 28 cases, in 24 of which a B.P.F. was prevented by a subcutaneous injection of 1 ccm. ten minutes before the beginning of anæsthesia. The pressure commenced to rise in 10—15 minutes after the injection, and the effect was maintained for 1—2½ hours. In four patients with a low hæmoglobin reading (25 per cent.) the rise of blood pressure was not so great as in normal patients. An injection of ½ ccm. in two patients with hypertonus produced a rise from 175 mm. Hg to 250 mm. Hg: pressure then sank gradually to 150 mm. Hg. No complications arose in this series of cases which could be attributed to the anæsthetic or the pituglandol.

FRANCIS E. SHIPWAY.

MISCELLANY.

Oliver Wendell Holmes first suggested the terms " Anæsthesia " and " Anæsthetic."

The President of the new American Society of Regional Anæsthesia is Dr. Gaston Labat, of New York City.

The New York Society of Anæsthetists, through its President, Dr. Robert B. Hammond, has presented its Historic Gavel to the Eastern Society of Anæsthetists.

Dr. Isabelle Herb administered the first ethylene-oxygen anæsthetic for a surgical operation performed by Dr. Arthur Bevan at the Presbyterian Hospital, Chicago, on March 14th, 1922.

Hydrogen gas as an anæsthetic agent is suggested by some experiments recently undertaken by Everett A. Tyler of Philadelphia. A rabbit was anæsthetised with 90 per cent. of the gas and 10 per cent. of oxygen. Further work is being continued in this direction.

Although Sir Humphrey Davy recognised the power of nitrous oxide to relieve pain considerably more than one hundred years ago, Dr. Horace Wells, a dentist of Hartford, Connecticut, first introduced it as an anæsthetic in 1844.

In an average of fourteen dissections, Thompson found that the end of the dural sac lay 5.8 cm. from the sacral ligament, the longest sac being 7 cm., and the shortest 4 cm.

Meltzer and Auer, in 1909, introduced their intratracheal insufflation apparatus which opened up great possibilities in thoracic surgery.

The first time ether was used in England was on Dec. 19, 1846, by Dr. Bott, a general practitioner of Gower Street, London, for the extraction of a tooth, Bigelow having brought over a small quantity from America. Two days later Lister did an amputation under it at the University College Hospital, William Squire administering the anæsthetic.

The Fifth Annual Meeting of the Canadian Anæsthetists will take place May 5—8 at Toronto. The Congress of Anæsthetists meets at Atlantic City, New Jersey, May 25—28. The Pacific Coast Anæsthetists meet in the Yosemite Valley on May 18—21.

The National Anæsthesia Research Society has been placed in the hands of a temporary Board of Professional Governors, and will in the future function as an International organisation. In this connection it has been announced that Dr. James H. Cotton of Toronto has placed all patents and processes covering his years of research work in trust to the International Federation of Anæsthetists, so that they could be made available to manufacturers on royalty, the proceeds to go to the Cotton Fund for Anæsthetic Research. Mr. M. B. Cheney,

a Cleveland Chemist, has likewise turned over to the same federation valuable patents with the same object in view.

The joint Anæsthetics Committee recently instituted by the Anæsthetic Section, Royal Society of Medicine, and the Medical Research Council, will have under consideration the following subjects :—

(1) The desirability of further research into the condensation and anæsthetic properties of di-methyl ether.
(2) Various points connected with the anæsthetic value of pure ether.
(3) The possibility of obtaining in this country an adequate supply of ethylene and acetylene for anæsthetic purposes.
(4) Impurities in nitrous oxide.

As representatives of the Section of Anæsthetics the Council has nominated Drs. Blomfield, Shipway and Hadfield.

MEDICO-LEGAL.

LOSS OF SIGHT OF ONE EYE AFTER ANÆSTHESIA.

MURDOCK *v.* HOLMES AND TAYLOR.

A case of considerable importance was heard at the Leicester Assizes on February 28th and March 2nd and 3rd. The plaintiff, Mr. George A. Murdock, sued Drs. W. Moffat Holmes and George Taylor, practising together in partnership, for damages for the loss of the sight of his left eye alleged to be due to their negligence during the administration of an anæsthetic for an operation. The defendants did not admit liability and denied the allegations.

Counsel, in opening the case for the plaintiff, said that about March 6th, 1924, Mr. Murdock was seized with abdominal pain due to appendicitis, and Mr. Bolton Carter, a surgeon, was called into consultation with the two defendants. An immediate operation was ordered, and was successfully performed the next day. Both the defendants were present, Dr. Taylor giving the anæsthetic. When plaintiff came round he complained of pain in his left eye. This continued, and on March 14th Dr. Holmes called in an ophthalmic surgeon, who found that parts of the eye were very badly scarred. Counsel added that the eye was now blind, all that remained by way of sight being the perception of light. As to which of the two defendants was responsible did not matter, for they were in partnership and both were liable.

The plaintiff, in the course of his evidence, said he had acute pain in the eye for six or seven weeks after the operation. In reply to the judge, he said that the defendants had not told him that it was the anæsthetic that had done the mischief. In cross-examination he agreed that his illness had brought him to the " very gates of death." He did not know that any of the anæsthetic went into his eye; he only knew " what the doctors admitted."

Mr. N. C. Ridley, consulting ophthalmic surgeon, Leicester Royal Infirmary, said that when he first saw the eye there was slight inflammation. The patient was in a bad condition—so bad that it did not matter about the eye, and Mr. Ridley thought he was dying. The condition of the eye was consistent with some of the anæsthetic having got into it. It was a frightfully common thing for some of the anæsthetic to get into the eye during an operation, but the patient did not then generally lose the sight of the eye. Witness took it that what might cause little or no injury in a healthy person had produced in this patient a destruction of the eye tissue. He thought the plaintiff somewhat exaggerated the amount of loss of sight. In cross-examination Mr. Ridley said that this was the only case of the kind in which he had known serious results occur, and added that the accident might have happened no matter how much care was taken.

On the resumption on March 2nd Mr. Healey addressed the jury for the defence, submitting that there was no definite piece of evidence to justify the jury coming to the conclusion that one drop of liquid came near the plaintiff's eye, and that at no time during the operation could anything have been done to prevent this injury. Counsel pointed out that during the operation there were eight persons in the room—three doctors, the patient, and four trained nurses—yet none of the nurses had been called to say what carelessness the anæsthetist had been guilty of. Nothing that a skilful administrator would have done was left undone.

Dr. Taylor, giving evidence, said he had administered an anæsthetic thousands of times, and, after describing the precautions taken by him during operations, demonstrated the method of anæsthesia adopted in that case. There were, he said, no signs during the operation of any anæsthetic having got into the eye; he always covered the whole of the face, including the eyes, with a pad. In this case he changed the pad once during the operation because it was getting damp.

Dr. R. Wallace Henry, ophthalmic surgeon of Leicester, said he agreed with the evidence given by Mr. Ridley. While the anæsthetic might have been the immediate cause of the eye condition, the main cause was the anæsthetic acting on an eye in a toxic condition. He did not think that it was possible to stop vapour from getting into the eye.

Dr. J. Blomfield, anæsthetist to St. George's Hospital, London, expressed the opinion that an anæsthetic could get into an eye without there being any lack of care or skill.

Mr. F. Bolton Carter, Surgeon to the Leicester Royal Infirmary, who performed the operation, said that the patient's condition before operation was extremely serious. It was only through the great care he received that he lived. There was no evidence that any liquid anæsthetic had got into the eye. With considerable experience of

anæsthetics he declared that Dr. Taylor gave the anæsthetic remarkably well and skilfully. In such a case it was essential for the patient to be deeply under, and this would entail saturating the mask with the anæsthetic. Mr. Carter added that there was an epidemic of " pink eye " or " anæsthetic eye " at the Leicester Royal Infirmary last year, and an inquiry was held. The anæsthetics were administered by two highly experienced men, who were absolutely certain that in none of these cases had the liquid anæsthetic got into the eye. In the majority of the cases the patients were in a septic condition. The eye trouble in these patients cleared up within three or four days, except in one case, in which the eye had to be removed.

Dr. M. H. Barton, honorary ophthalmic surgeon, Leicester Royal Infirmary, said he had seen eyes in the condition like that of the plaintiff without the patient ever having an anæsthetic. The scar on plaintiff's eye was consistent with its having been caused by vapour and not by liquid. But vapour alone would not have caused the trouble in this case, and he agreed with Mr. Carter that the main cause was a germ. The next witness, Miss Evans, sister at the Highfields Hospital, said she observed nothing abnormal about the giving of the anæsthetic.

In the course of his summing up, Mr. Justice Rigby Swift said that the plaintiff had had the advantage of the best medical and surgical skill which could be obtained for him in Leicester, and fortunately his life was saved. Whether in the end the jury came to the conclusion that anyone was responsible for the injury to the eye, they must consider whether a case of negligence had been made out. Before plaintiff could get any damages they must be satisfied that he had experienced a very terrible injury and one for which, if he was to be compensated at all, he must be compensated by a very large sum of money. Here was a business man, getting past the prime of life, who said he was now unable to lead an active life and take complete control of his firm's works. If this were so, then the compensation should be very substantial, although, measured in pounds, shillings, and pence, no money the jury could give him would restore his blinded eye and put him back again as he was before the accident. If plaintiff was entitled to any damages, the jury must in arriving at the figure consider what had been done to him, not how much the defendants could afford to pay, nor what the consequences to the defendants would be if the verdict went against them. Before finding for the plaintiff the jury must be satisfied that in the administration of the anæsthetic Dr. Taylor did something which a reasonable person would not have done; they must not find for the plaintiff out of sympathy.

After an absence of an hour and three-quarters the jury returned to court and informed the judge that they were unable to agree. They then retired for eighteen minutes more, when the judge was again informed that agreement was impossible.

Prof. Frederick T. G. Hobday, President of the Comparative Medicine Section of the Royal Society of Medicine, at a recent meeting of the Anæsthetic Section, Royal Society of Medicine, drew attention to the fact that the administration of anæsthetics to animals had much in common in its methods with the administration to man, but that there were also very great differences owing to the different varieties of domesticated and wild animals, with their varied anatomical arrangements of the digestive and other organs, their different mental calibres, and the conditions under which the veterinary practitioner had to perform the anæsthetisation. He illustrated, by means of the epidiascope, the different methods by which animal patients were secured before anæsthetisation, emphasising the necessity of giving, as far as possible, free play to the heart and lungs. He stated that the main points for the veterinarian to have in his mind were: first, to examine the general condition of the patient with a view to finding out its freedom or otherwise from serious organic disease; secondly, to make sure that it had been properly prepared, as to anæsthetise an animal on a full and distended stomach is to ask for trouble just as much as in the case of man; and thirdly, to see that nothing interfered with the free movement of the heart and lungs.

For general anæsthesia Professor Hobday discoursed upon the merits of chloroform, ether and A.C.E. mixture, asserting that from his experience of over 30 years, in which he claimed to have done 12,000 anæsthetisations, he preferred pure chloroform for the adult horse, cow or dog, and A.C.E. mixture or ether for the monkey, puppy or the cat. He made the assertion that chloroform was an ideal and safe anæsthetic for the horse and the dog if given by rational methods, and he outlined the methods (illustrated by the epidiascope) which his experience had taught him to consider the best.

It was emphasised that the chief safeguard was to proceed to administer the chloroform slowly at the commencement, allowing a period of from 8—10 minutes to produce complete anæsthesia in the horse, and in the dog from 5—10 minutes, according to its size, age and breed.

Prof. Hobday also described the use of anæsthetics for birds, and showed on the screen the use of chloroform, as practised for caponising ostriches, by the veterinary surgeons in South Africa.

He mentioned the antidotal use of full medicinal doses of Scheele's hydrocyanic acid as an adjunct to artificial respiration.

Amongst the local anæsthetics he named cocaine, eucaine, novocaine, stovaine, procaine, holocaine, urea and quinine, eudrenine, ether spray, and ethyl chloride; with agents such as adrenaline, suprarenin and renastyptin as adjuncts. He also drew attention to the idiosyncrasy to toxicity of cocaine for the various animals.

Intraspinal anæsthesia was also touched upon with its comparative difficulties for the horse and dog.

SOCIETY MEETING.

A meeting of the Anæsthetic Section of the Royal Society of Medicine was held on December 12th. Minutes of the last meeting were read and confirmed. The President read a telegram from Dr. Flemming, the late President, regretting that he was unable to attend. The President then called upon Mr. Hillman and Mr. Apperley to read their papers on Splanchnic Anæsthesia.

Mr. Hillman said that Crile's method of Anoci Association, by which nerve impulses passing from an operative field were cut off by means of a local infiltration of novocaine, had its limitations and perhaps disadvantages. The method to be described was a regional analgesia and could be applied to operations on the viscera, which Crile's method could not.

Splanchnic analgesia was defined as consisting of a block placed in the pathway of impulses passing up the great splanchnic nerves to the central nervous system.

Prof. Pannett's article in the *British Journal of Surgery* was then referred to as affording proof that impulses did pass up the splanchnic nerves, producing shock. Prof. Pannett also showed that rigidity of the abdominal wall was reduced by novocaining the mesenteries of the viscera operated upon. Mr. Hillman then referred to a case of perforated gastric ulcer on which he had performed a splanchnic block. This man was writhing with pain, but when the block was completed it was found that all his pain had vanished; this case furnished clinical proof that afferent impulses did pass up the splanchnic nerves.

Slides were shown illustrating the course of the splanchnic nerves along the sides of the vertebræ and piercing the crura of the diaphragm, and it was pointed out that to establish the splanchnic block it was necessary to place the novocaine opposite the first lumbar vertebra.

It was necessary for operating on the abdomen to block the nerves supplying the segment of the abdominal wall involved by means of a field block. Under these two blocks it was possible to operate without any general anæsthetic at all, and Mr. Gordon-Taylor had under this method performed the greater part of two partial gastrectomies, a gastro-enterostomy, removed an ovarian cyst and drained a pelvic appendix abscess. It was found that this involved some psychic shock to the patient and considerable strain on the surgeon, and for these reasons the technique was changed and an anæsthetic given for the block and continued throughout the operation.

An illustration was shown of the syringe used, the needles being of rustless steel, and the one used for the splanchnic block being 12 cms. long and 1 mm. in diameter. The anæsthetic fluid used was 1 per cent. novocaine, and of this solution never more than 5 ounces were poured out for each patient, as this amount contained the safe dose of the drug.

The block is performed with the patient lying on the side and with

a pillow under the loin so as to prevent sagging of the spine. The first lumbar spinous process is found and a point 7 cms. external to this measured. At this point if the patient were conscious a cuticular wheal was raised, or if under an anæsthetic the needle was entered at once and pushed on at about an angle of 45 degrees to the median plane until the body of the first lumbar vertebra was struck. The needle was then withdrawn until its direction could be changed when it was re-entered, directed a little more forwards and still upwards and inwards. If now the needle was in the right position it would be felt to slip by the body of the vertebra when it was pushed on another 1 cm. and there stopped. The syringe, filled with 10 ccs. of novocaine solution, was attached to the needle and injection of the solution made after careful aspirating to ascertain that the needle was not in a blood vessel; more novocaine was then injected, using in all 25 to 30 ccs.

It was pointed out that the procedure was not difficult but that it must be carried out in full detail and that aspiration must never be omitted, for should that quantity of novocaine be discharged into a blood vessel the result would be a fatality. A good knowledge of the anatomy involved was necessary for good results and for overcoming difficulties. Gentleness also was essential especially when working on a conscious patient.

The abdominal field block was then described. If the patient were conscious wheals were raised along the costal margin and along the outer border of the two recti, and through each of these in turn the needle was introduced; if the patient were not conscious the needle was introduced straight away at the same points. At each point the needle was directed vertically until the posterior wall of the rectus sheath was reached; at this point 2 ccs. of the novocaine was injected. The needle was withdrawn and its direction changed upwards or downwards and injection again made when the posterior wall was struck; in this way the whole area within the area of the wheals was anæsthetised. By the time the patient was wheeled into the theatre and the towels placed in position the anæsthesia was complete.

The advantages and disadvantages were then discussed.

The Advantages to the Surgeon were said to be—

1. There were very small respiratory excursions.
2. There was complete and perfect muscular relaxation.
3. There was total absence of sudden straining on the part of the patient when any necessary traction was made.
4. The surgeon was relieved of all anxiety, as he knew that his patient was receiving no shock.

The Disadvantages to the Surgeon.

These were thought to be two in number, but it was thought that these were easily outweighed by the advantages gained. The first was the addition of 15 to 20 minutes to the time required to anæsthetise the patient. The second was the fact that if the operation was a long one the field block sometimes wore off causing some

rigidity of the abdominal wall when sewing up; this could easily be overcome with the co-operation of the anæsthetist.

The Advantages to the Patient. These were enumerated as follows:

1. The patient received less anæsthetic drug.
2. There was the minimum of shock.
3. There was no fatigue from excessive respiratory excursions.
4. There was no falling off in the condition of the patient after return to the ward as is often seen after pure ether anæsthesia.
5. The day following operation the patient was in better condition owing to the absence of shock.
6. There appeared to be less post-operative pain.
7. Some patient who would otherwise be inoperable can be given the chance of an operation by this method.

The Disadvantages to the Patient.

It was said that a few patients had had headaches after the splanchnic block, a few were troubled with flatulence, and one patient had had severe neuralgic pain in the back.

Effects on the Pulse Rate and Blood Pressure.

Slides were shown of graphs which illustrated the fact that the blood pressure fell during the early part of the operation but that the pulse rate did not rise with the fall; this showed that the fall was not due to shock. The graphs also brought out that there was no slump in the patient's condition on return to the ward, as readings had been taken up to two hours after the operations.

Mr. Hillman said that he had performed the splanchnic block on 49 cases; 38 were upper abdominal cases, and of these 26 were partial gastrectomies. Of this series not one patient had developed any chest complication, and one patient had pulmonary tubercle, on account of which he had been refused operation at another hospital, and another had a definite chronic bronchitis. Not one of these patients had died of shock.

A table comparing 31 cases of partial gastrectomy with and without splanchnic analgesia was shown, and it was demonstrated that the immediate mortality had fallen from 12.9 per cent. to 3.2 per cent., and that the average pulse rate after operation had fallen from 111 to 85. The table also showed that the number of blood transfusions had decreased from 14 to 2, and it was pointed out that these two were given for previous hæmorrhage and not for shock.

Mr. Hillman said that while not thinking that splanchnic analgesia was necessary in all upper abdominal operations, he thought that in gastric surgery where the extent of the operation could never be known until the abdomen was opened, it would be an advantage to adopt the procedure as a routine, combined with as little general anæsthetic as possible. In this way he thought that shock would be overcome and the risk of the patient developing any chest complication reduced to the minimum.

In concluding, thanks were expressed to Mr. Gordon-Taylor on whose cases the paper had been based.

Mr. Apperly, in the course of his paper on "Splanchnic analgesia from the anæsthetist's point of view," thought that anæsthetists had in the past neglected regional and local methods. He urged the more extended use of regional and local analgesia in combination with light general anæsthesia. It was the place of the anæsthetist to give the regional block rather than the surgeon, who in a serious case, was fully occupied in his preparations.

Since first trying splanchnic analgesia with abdominal field block, Mr. Apperly or Mr. Hillman had used the method, with light general anæsthesia, in every case in which partial gastrectomy was anticipated, and in other operations in the upper abdomen where the patient's general condition was poor or chest complications were present.

Light general anæsthesia, in addition to splanchnic block, was preferred, as splenchnic block was made easier, less preliminary narcotic was used, psychic shock was abolished, and if the operation was a long one the general anæsthesia could be deepened easily towards the end if the abdominal field block was wearing off.

In most cases morphia gr. $\frac{1}{6}$ or gr. $\frac{1}{4}$ with atropine gr. 1/100 was given three quarters of an hour before operation. General anæsthesia was then induced with gas and ether or a mixture of chloroform and ether, and the splanchnic and abdominal field block done as Mr. Hillman had described. Afterwards a very light general anæsthesia was maintained. It was pointed out that gentleness on the part of the surgeon is essential in obtaining the best results, otherwise tissues outside the area of analgesia may be pulled on.

The disadvantages of the method appeared to be the fall of blood pressure, headache and backache in a few cases and the time taken in doing the nerve block. It was urged, however, that the absence of post-operative pulmonary complications, the absence of shock, and quiet respiratory excursion outweighed the disadvantages. Only one post-operative pulmonary complication occurred in the 91 cases of splanchnic block recorded by Mr. Hillman and Mr. Apperly and this was a case of broncho-pneumonia after partial gastrectomy.

Mr. Gordon Taylor said that his opinion coincided with both of the previous speakers. Most of the cases had been for partial gastrectomies, and he thought that splanchnic anæsthesia plus a light general anæsthesia had considerably reduced not only shock but post-operative mortality; before he had used this method he had had a great deal of pneumonia, etc., and a definite mortality in upper abdominal cases, but that now the post-operative pulmonary complications had been reduced to about zero.

The great objection was the waste of time, but when one considered the reduction in mortality the time was not wasted.

He thought that it was good to give a general anæsthetic as well, not only for the patient but also for the surgeon's comfort.

Mr. Geoffrey Cade said that he had given 50 cases of regional anæsthesia, of which 27 were splanchnic. He used $\frac{1}{2}$ per cent.

novocaine instead of 1 per cent., and he injected 100 ccs. plus field block, believing that bulk was more important. He had 10 failures owing to errors in technique. He thought it was a valuable method in acute intestinal cases, and instanced a case of resection of three feet of gangrenous jejunum with recovery. He had done eight cases of nephrectomy and only one needed a general anæsthetic.

On the question of novocaine poisoning he said the signs were palpitation and cyanosis of the lips and fingers, and that if novocaine was given intravenously it produced apnœa; in fact in animals intravenous novocaine produced a marked fall of blood pressure with apnœa and death.

Dr. Hugh Phillips asked what length of anæsthesia could be obtained by this method?

Dr. Hadfield also enquired as to the duration of the anæsthesia, and wanted to know why the analgesia of the abdominal block was shorter than the splanchnic; he also enquired whether this method was satisfactory in private work.

Dr. C. L. Hewer thought the method was of great value; he had done nine cases, using the same technique as the readers of the papers except that he had injected 20 ccs. on each side; he had found that when injecting methylene blue on the post-mortem subject that the fluid tracked up in an extraordinary manner. He thought the method did diminish shock, and that neither Mr. Hillman nor Mr. Apperley had over-estimated the case for splanchnic anæsthesia.

Dr. Blomfield referred to one point in the technique; he noted that adrenaline was not used with novocaine, and in his opinion adrenaline was a dreadful drug as you never knew where you were with it.

Mr. Howard Jones asked if they had ever drawn blood when they injected their needles?

Mr. Featherstone enquired whether they had ever found any weakening of the diaphragm, or had there been any collapse of the lung?

In reply, Mr. Hillman said that the operations had lasted from 2 hours 20 minutes to 2 hours 50 minutes, and in each of those cases the pulse rate had been 84 and 88 respectively at the end of the cases. The average length of anæsthesia was about 1½ hours. He thought that the reason why the abdominal block did not last as long as the splanchnic was that the abdominal wall was better supplied with blood vessels.

Mr. Apperley in reply said that he had had ten operations in private practice. That he had had no case of damage to the diaphragm or collapse of the lung. He had had only one case of bronchopneumonia.

The Title page and Index to Vol. II. of the "British Journal of Anæsthesia" will be issued with the July number.

NITROUS OXIDE

Specially purified for Use as an

ANÆSTHETIC

AND

Specially dried to ensure a steady flow of gas from the cylinder.

The British Oxygen Co. Ltd. have pleasure in announcing that their modern Nitrous Oxide plants at WEMBLEY are now in full operation, and that arrangements are now in force for a reliable and regular

FREE LONDON MOTOR DELIVERY SERVICE.

Every district in the London Postal Area is covered by this service and Hospitals, Anæsthetists, Dental Surgeons, etc., who are not already availing themselves of it, should send a postcard for further particulars.

The Company do not require customers to purchase their own cylinders, but lend N_2O cylinders from their own stocks free of charge for six calendar months.

Provincial users should communicate with WEMBLEY or the Company's MANCHESTER Works, where N_2O is also produced, or with any of the Company's other Works, as under:—

BOOTLE	BIRKENHEAD	BELFAST
CARDIFF	BIRMINGHAM	COVENTRY
DOVER	EAST GREENWICH	GLASGOW
HULL	SOUTHAMPTON	SWANSEA
LEEDS	STOCKTON-ON-TEES	SHEFFIELD
LEITH	WOLVERHAMPTON	
WITHAM	NEWCASTLE	

Produced at Wembley.

OXYGEN NITROGEN HYDROGEN ARGON
LIQUID OXYGEN
SULPHUR DIOXIDE COMPRESSED AIR
HELIUM-NEON MIXTURE
LIQUID AIR NITROUS OXIDE NEON

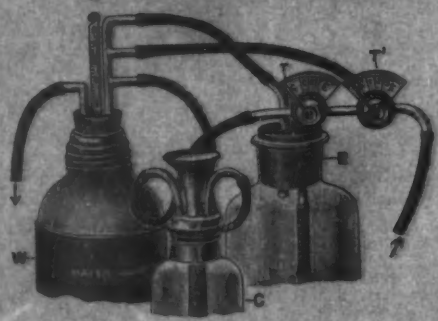
The British Oxygen Company Limited,

Telephone Wembley 250 (5 lines)

WEMBLEY.

Registered Offices: Angel Rd., Upper Edmonton, N. 18

Telegrams "Oxygen, Wembley."



Regulating Apparatus for the Administration of Warm Anæsthetic Vapours.

Devised by
FRANCIS E. SHIPWAY, M.D.

By means of this apparatus, warm ether (open method), chloroform or C.E., can be given in concentrations adequate for any operation, and with a lessened consumption of anæsthetic.

—

The figure below shows an additional tap arranged for the purpose of giving a constant supply of oxygen with variable amounts of ether, chloroform or mixtures of the two.

Full particulars and complete catalogue of Modern Anæsthetic Apparatus sent on request.

Mayer & Phelps

MANUFACTURERS OF SURGICAL INSTRUMENTS.

—

ESTABLISHED 60 YEARS.

CHIRON HOUSE,
39 & 61, New Cavendish Street, London, W.1.
Telephone: MAYFAIR 6320. Telegrams: "TREPHINE, WESDO, LONDON.

Sherratt & Hughes, Printers, Manchester.